

Correspondence.

American Locomotives.

To the Editor of the SCIENTIFIC AMERICAN :

The valuable series of articles which has appeared in the columns of the SUPPLEMENT is of very great interest to historians upon the English side of the Atlantic, and it also proves beyond all question the vast importance of the collection which was made at the Chicago exhibition of 1893.

In the course of my investigations I have ascertained that in the early days of American railroads, that is between 1828 and 1837, a large number of engines were sent out from England, as follows : By R. Stephenson & Company, 39 locomotives ; by E. Bury & Company, 20 locomotives ; by C. Tayleur & Company, 7 locomotives ; by Rothwell & Company, 7 locomotive ; total, 73 locomotives.

In addition to these, there is reason to believe that about fifteen others were sent, of which the full details cannot be traced in England, but of which some details were at the Chicago exhibition.

The articles in your columns have very clearly proved that the leading bogie or truck was used by Jervis in 1832, a year before the Davy Crockett was sent from England ; they also prove that the link motion was first invented in America. In conclusion, allow me to express the hope that the interesting series of articles may be issued by you in a handy book form.

CLEMENT E. STRETTON.

Leicester, Eng., May 11.

[The articles referred to by Mr. Stretton, the well known English locomotive authority and author of the "Locomotive and its Development," are those which have been published in SUPPLEMENT, Nos. 1112, 1113, 1114, from the pen of Mr. Herbert T. Walker.]

Coal Tar for Roofs.

To the Editor of the SCIENTIFIC AMERICAN :

E. J. B., 7144, Notes and Queries, desires to know how to prepare coal tar for roofing paint. I have used it for roofing for years and find it very durable.

I buy second grade resin oil in preference to anything else to thin it, so that it can be easily worked.

This oil can be bought of the maker in this city at fifteen cents per gallon in barrels. Smaller quantities same price, if you find your own package. I hire any handy man, give him a stiff corn broom, and he will put it on a great deal faster and rub it in better than with a paint brush.

CHARLES R. WEBB.

Philadelphia.

National Debts of the World.

It is a well-known paradox that a country cannot be prosperous without a certain amount of national debt. This may be disputed, but it is certain that hardly a civilized nation is to be found to-day without the burden of national debt. The Handels-Zeitung, New York, compiled some interesting statistics on the subject, from which the Literary Digest quotes the following:

"The total national debt of the world is now \$29,000,000,000, while in 1875 it was \$23,750,000,000. France has the distinction of leading the world in this regard with a debt of \$6,000,000,000, followed by Great Britain with \$3,300,000,000. The third on the list is Austria-Hungary with \$3,030,000,000, while Russia is fourth with \$2,875,000,000 and Italy fifth with \$2,530,000,000. Spain comes next, with \$1,395,000,000, and the United States is seventh with \$996,141,952. Germany has a debt of only \$420,000,000.

"Spain owes comparatively the largest sum to foreigners, while in France the great bulk of the papers are in possession of the Frenchmen themselves. But nearly every other nation is indebted for enormous amounts to its own subjects. France takes the lead as a lending people on account of the good financial standing and the saving propensities of its people. The example of France seems to confirm the proposition that a national debt is a good thing for the prosperity of a people, for in that country the national debt and the general prosperity of the populace have steadily advanced in recent decades in equal proportions.

"The growth of national debts can be seen from the following table, in which the figures for twenty years ago are given in the first column, those for to-day in the second column :

France.....	\$4,500,000,000	\$6,000,000,000
England.....	3,900,000,000	3,300,000,000
Austria-Hungary.....	1,750,000,000	3,000,000,000
Russia.....	1,700,000,000	2,875,000,000
Italy.....	1,950,000,000	2,530,000,000
United States.....	2,220,000,000	996,141,952
Spain.....	1,375,000,000	1,395,000,000
Germany.....	1,000,000,000	420,000,000
Australasia.....	280,000,000	1,200,000,000
Turkey.....	675,000,000	900,000,000
Portugal.....	345,000,000	765,000,000
India.....	650,000,000	635,000,000
Brazil.....	475,000,000	590,000,000
Egypt.....	375,000,000	530,000,000

"Rather remarkable is the increase of debt in Australasia, especially over against the repeated statement of Great Britain that its loyal colonies enjoy a higher

degree of prosperity than do those that have become independent. Japan and the Argentine Republic belong to the states that have in recent years been contracting debts on a large scale, the former now having \$235,000,000 and the latter \$370,000,000. Borrowers on a somewhat smaller scale are Belgium, with a debt of \$445,000,000, Holland with \$460,000,000, Canada with \$255,000,000, an increase of \$100,000,000 since 1875. The total debt of Great Britain, including the colonies, is \$5,485,000,000, almost equal to the debt of France.

"One reason for the enormous increase of national debts is probably the fact that money is now much cheaper than it was twenty years ago. At present the total sum of interest to be paid on national debts is \$1,115,000,000, while twenty years ago it was \$1,000,000,000, although the total debt at that time was \$5,000,000,000 less than it is at present. In 1875 Spain and Mexico paid as high as 15 and 18 per cent interest. Although the national debt of France is so enormous, yet it pays comparatively the smallest amount of interest money, namely \$185,000,000, while Great Britain pays annually \$125,000,000 ; Russia, \$120,000,000 ; Italy, \$117,000,000 ; Spain, \$56,000,000 ; Austria-Hungary as much as \$186,000,000. The latter country, accordingly, pays more interest than France, although the French debt is twice as large as that of the Austrian empire. It is interesting to note that each inhabitant of France must, on the average, pay each year \$4.75 interest on the national debt ; each Russian, \$1.20 ; each Englishman, \$3.15 ; each Austrian, \$7.50 ; each Italian, \$3.80 ; each Spaniard, \$3.25 ; each American, 42 cents ; and each German, 33 cents."

Recent Patent and Trade Mark Decisions.

Davis v. Chesapeake & P. Telegraph Company (U. S. C. C., Md.), 77 Fed., 895.

Implied License.—The patentee of a telephone device who sells out to a company of which he is a stockholder, a telephone exchange in which his device is used, thereby impliedly licenses the device in use at the time of sale, but no other such devices.

Electric Switch Pin.—The Watts patent, No. 223,969, for an electric switch pin, so constructed as to retain itself exactly in the switch board, as against any liability to be displaced by jars or jolts, has been held valid and construed.

New York Filter Manufacturing Company v. Niagara Falls Waterworks Company (U. S. C. C., N. Y.), 87 Fed., 900.

Infringement of Method of Filtration.—The Hyatt patent, No. 293,740, for a method of purifying water by introducing into it a coagulant simultaneous with its passage through the filter, thereby avoiding the settling basins of the prior art and making the process continuous, has been, on motion for preliminary injunction, construed and held infringed by a process in which the water is passed by a continuous flow through tanks before entering the filter, such tanks not performing the function of settling tanks.

Roemer v. Peddie (U. S. C. C. A., 3d Cir.), 78 Fed., 117.

Satchel Handles.—The Roemer patent, No. 314,724, for the combination of a strap and metal plates arranged on opposite sides, with the edges of the strap projecting beyond the plates and a covering secured to such edges to make satchel handles, has been limited to the precise device shown, and held not to be infringed by a handle having only one metal plate.

Green v. American Soda Fountain Company (U. S. C. C. A., 3d Cir.), 78 Fed., 119.

Soda Fountains.—The Witting patent, No. 414,272, has been held to be invalid as to the second claim for want of invention over the Adami and Lippincott apparatus. It was a mere matter of mechanical choice with Witting whether to make a lift or drop door to his case. He adopted the door as Adami had done and journaled the key as Lippincott had done, so that he produced no new result and no new and improved means for obtaining an old result.

Robbins v. Illinois Watch Company (U. S. C. C., Ill.), 78 Fed., 124.

Proof of Profits.—The profits of an infringer, where its books show none, cannot be established by proving the profits made by another manufacturer of the same kind of article and of the same grade, and if there is no other proof in the case, no decree for profits can be made. Where no profits have been made on sales, it is needless to attempt to apportion the profits arising from the part of the device manufactured that was covered by the patent. An infringer is under no obligation to the patent owner to so use the patented device or to so manage his infringing business as to make a profit.

Accident on the Third Rail Route.

By the dropping of the brake bar of a freight car of the new Third Rail branch of the N. Y., N. H. & H. R.R., on May 15, the switchboard at the Berlin, Connecticut, power houses was burned out, causing a loss of one thousand dollars, delaying probably for a week the opening of the Third Rail route between New Britain and Hartford.

Science Notes.

It is said that the inhabitants of the Andaman Islands are the smallest race of people in the world. The average height of a full grown Andaman is less than four feet. The anthropological experts who visited them found that but few weighed over seventy-five pounds.

Matthew Carey Lea, who died on March 15, made many chemical researches, especially those relating to the chemistry of photography and to the action of light and other forms of energy upon silver salts. His most remarkable discovery was made in 1889, that silver was capable of existing in the three allotropic states.

Prince Luigi Amadeo of Savoy, Duke of Abruzzi and nephew of King Humbert, is on his way to the United States, from whence he will go to Alaska and make an attempt to ascend Mt. St. Elias. The party will take a steamer at Tacoma for Yakutat Bay, which it is proposed to reach about June 25. The party by boat and sleigh will then cross the glaciers and mountains to the foot of Mt. St. Elias.

The two lenses for the Yerkes telescope in the Yerkes Observatory, at Williams Bay, Wis., were shipped on May 17, from the works of Professor Alvan G. Clark, at Cambridge, Mass. These disks are the largest ever made. A parlor car especially fitted up for the purpose was used in shipment. Guards were stationed at each door of the car and Professor Clark and his foreman took turns in watching the lenses.

M. Alphonse Berget has recently described a very interesting physical experiment for studying the expansion of liquids by means of photography. Two balances of equal sensibility with their planes of oscillations at right angles carry two weight thermometers ; one containing the liquid under examination and the other mercury. A ray of light is deflected from two mirrors, one on each beam ; this records on a sensitive plate a curve analogous to Lissajous' figures. This curve is the graphical representation of the expansion of the liquid.

The will of the late Professor Edward D. Cope, after making ample provision for his family, gives his collections for the benefit of science. His collections are given to the University of Pennsylvania, the Cincinnati Museum of Natural History, the American Museum of Natural History, the Philadelphia Academy of Natural Sciences. Certain of his collections are to be sold, and the available amount, estimated to be \$40,000, is to be given to the Academy of Natural Sciences of Philadelphia, as an endowment for a professorship or curatorship of vertebrate paleontology.

At a recent meeting of the Paris Academy of Sciences M. Lacroix stated that recently in demolishing the old convent of the Place Royale, two old lead coffins were found bearing the date 1630. On opening one of the coffins the skeleton within was found to be partially wasted away and covered with crystals of hydrated bicaleic phosphate. The crystals were specially in evidence in the skull. They had evidently been produced by the action of the products of the decomposition of the body upon the calcium carbonate in the bones. The brain seems to have had an especial active part in this mineralization. The lead coffin had been very carefully sealed up, so that there could have been no action from the outside.

F. Mylius, F. Foerster, and G. Schoene, of the Physikalisch-technische Reichsanstalt, in Charlottenburg, Germany, have ascertained that ordinary steel contains iron carbide, Fe₃C. This compound contains 6.63 per cent of carbon and is similar to iron in appearance and in regard to magnetic properties ; it differs from iron particularly by its great brittleness. So far the carbide has been found only in crystalline structure in manufactured steel, but it is known that some meteorites contain iron carbide in the form of crystals. Iron carbide is dissociated by heat, and reacts with iron at a bright red heat. Tempered steel contains no iron carbide, or only a very small amount of it.—Prometheus.

Some interesting experiments have recently been carried out by Professor W. Ritter on the oscillations of a tower in Zurich produced by the ringing of bells, says the Engineer. The tower, which is 39½ meters high, contains five bells, ranging in weight from 425 to 3430 kilo., and it is remarkable that the light bells produced greater oscillations of the tower than the heavy ones. The horizontal oscillations were elliptical in shape and variable in size, those produced by a bell of 705 kilo., which was swung fifty-three times per minute, being at a maximum of 3.6 mm. long and 2.4 mm. wide, the longest axis being in the direction of the movement of the bell. When the five bells were rung at once, the ellipse had a maximum major axis of 5.8 mm. and a minor axis of 4.4 mm. The bells were swung from forty-three to fifty-seven times per minute, while the tower oscillated quite uniformly 160 times per minute. It was shown that the oscillations were felt at any point in the tower below the bells, and that the amount of movement was proportional to the height above the ground. According to the principle of the conservation of center of gravity, the tower tends to move in the opposite direction to that of the bell, and this movement increases until the resistance of the masonry produces equilibrium with the impulsive forces.